



## **Very-low- to low-grade metamorphism of mafic and felsic volcanic rocks in Avalonia of SE Cape Breton Island (Nova Scotia; Canada) as a result of collision**

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To better understand geodynamic processes in late Neoproterozoic to Cambrian times which resulted in metamorphism of volcanic rocks in the Avalonian Mira terrane of SE Cape Breton Island (protolith ages: 680-560 Ma), we have studied 15 white-mica-bearing mafic and felsic metavolcanic rocks. The felsic metavolcanic rocks are invariably sheared and mylonitized with a blastoporphyric relict fabric. They show the assemblage epidote-chlorite-phengite-albite-quartz-titanite with rare relicts of magmatic K-feldspar. By contrast, many mafic metavolcanic rocks are relatively undeformed and display relict porphyritic and amygdaloidal textures. The mafic metavolcanic rocks contain the assemblage epidote-chlorite-phengite-albite-quartz-titanite  $\pm$  actinolite  $\pm$  pumpellyite  $\pm$  calcite. Inhomogeneous equilibration is indicated by local relicts of magmatic clinopyroxene and plagioclase as well as local occurrences of low-pressure metamorphic phases such as prehnite and K-feldspar. The latter phases formed during the pro- or retrograde PT-path. Preserved earlier local equilibria (e.g. McMullin et al. 2010) are due to lack of recrystallization and compositional homogenization at thin-section scale at very-low grade conditions. Potassic white-mica in both rock types is mostly phengite with a wide compositional range (3.15-3.50 Si pfu). Maximum Si-contents are typically at 3.30-3.41 apfu, but locally up to 3.50 apfu.

PT-pseudosections were calculated for the range 200-450°C, 1-10 kbar with the PERPLE\_X software (Connolly 2005) using the thermodynamic data set and solid solution models of Holland and Powell (1998, 2003) with supplements by Massonne and Willner (2008). The peak metamorphic assemblages occupy PT-fields consistent with the position of isolines for corresponding maximum Si-contents in white mica that overlap in the PT-space of 3.1-6.0 kbar, 260-320°C. Average peak PT-conditions of  $4.0 \pm 0.5$  kbar,  $290 \pm 30^\circ\text{C}$  result for the Mira terrane samples. Higher pressure conditions can locally be expected in rocks containing phengite with Si-contents of 3.50 apfu. The derived peak metamorphic conditions suggest burial to at least 12-16 km depth under a low metamorphic geotherm of 16-23°C/km. In contrast to previous studies (McMullin et al. 2010), the detected medium pressure metamorphism in the Mira terrane is compatible with collisional processes and related crustal thickening. The timing of this metamorphism predated deposition of overlying Cambrian sedimentary sequences which contain white mica with  $40\text{Ar}/39\text{Ar}$  ages of ca. 550 Ma and older (Reynolds et al. 2009) and was probably related to assembly of Avalonia in the Late Neoproterozoic.

### References:

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